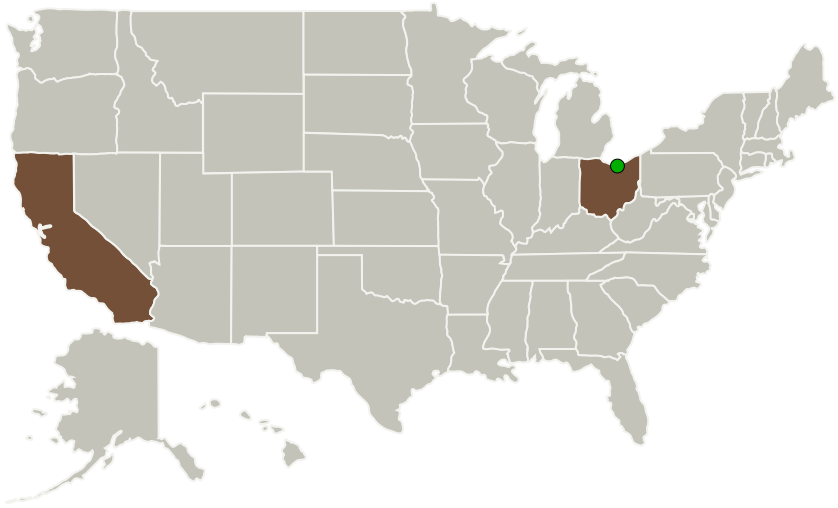
Hybrid Electric Propulsion System for a 4 Passenger VTOL Aircraft, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

The advancement of hybrid-electric propulsion systems for rotorcraft enables vertical takeoff and landing (VTOL) vehicles to take advantage of aerodynamic efficiencies that can reduce fuel consumption and emissions compared to conventional rotorcraft vehicles. Unlike conventional internal combustion engines or high speed turbine engines, the high power-to-weight ratio and energy efficiency of electric motors is conserved when the motor is scaled to a smaller size. A distributed electric propulsion system for a VTOL aircraft can exploit aerodynamic benefits increasing the lift to drag ratio by 4 to 5 times (Fredericks et al, Intl Powered Lift Conf., Aug 2013) compared to that of convectional helicopters. This can yield a 4x increase in range while maintaining the VTOL and hover capabilities of a conventional helicopter. Using LaunchPoint Technologies' brushless electric motor optimization software, controller expertise, and battery technology, LaunchPoint proposes to design a hybrid propulsion system for a VTOL aircraft that has an extremely high power-to-weight ratio, to demonstrate the validity of a concept VTOL vehicle. LaunchPoint Technologies will seek robust system solutions for this hybrid electric propulsion including specifications for motor (propeller) distribution, motor power, lift, drag, a heavy-fuel combustion engine, alternator, battery pack, vehicle range and hover duration. LaunchPoint will then produce a detailed design of the Auxiliary Power Unit (combustion engine and alternator), motors, electrical systems, and power control systems for the aircraft. LaunchPoint will also further develop their dual-Halbach array brushless motor technology by building and testing a carbon fiber composite rotor to increase the specific power density of this propulsion system.

Primary U.S. Work Locations and Key Partners



Hybrid Electric Propulsion System for a 4 Passenger VTOL Aircraft Project Image

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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
LaunchPoint Technologies, Inc.	Lead Organization	Industry	Goleta, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140726)*

Images

Project Image
Hybrid Electric Propulsion System for a 4 Passenger VTOL Aircraft Project Image
(https://techport.nasa.gov/image/126893)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
LaunchPoint Technologies, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

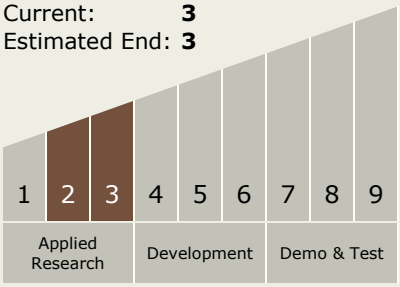
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jessica A Dozoretz

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System